HAMILTON ROAD

(CENTRAL)

City of Gahanna

E.P. Ferris

MORPC

Welcome & Introductions

- Consultant: E.P. Ferris
  - Dave Younger, PE
- City of Gahanna
  - Thomas Komlanc, PE

HAMILTON ROAD
(CENTRAL)

- Cell Phones –please set to vibrate or turn off
- Questions –will be entertained at the conclusion of the presentation
- Time –presentation is lengthy, detailed questions that may be more involved will be handled in a follow up memorandum

Presentation Outline

- 2032 Forecast of Design Hourly Volumes
  - Dave Younger, PE
- 3-Lane Alternative
  - Thomas Komlanc, PE
- 4-Lane Alternative
  - Dave Younger, PE
- 5-Lane Alternative
  - Dave Younger, PE

Present Traffic Volumes

- 2004 Annual Average Daily Traffic
  - 18800 vehicles / day
- 2001 Annual Average Daily Traffic
  - 16700 vehicles / day
- 1997 Annual Average Daily Traffic
  - 15100 vehicles / day

Present Peak Hour Volumes

- Weekday Peak Hours: 7-8 a.m. 5-6 p.m.
  - –a.m. peak volume: 6.5% of Daily Volume
  - –p.m. peak volume: 8.5% of Daily Volume

Present Peak Hour Volumes (Cont.)

- a.m. volume: 1240 vehicles per hour
  - Directional Distribution 40 % NB 60 % SB
- p.m. volume: 1650 vehicles per hour
  - Directional Distribution 60 % NB 40 % SB

Future Traffic (Design) Forecast

- MORPC: Travel Demand Model for 2030
- Design criteria: 20 year useful-life of project
- Estimated opening day 2012; therefore 2032
- Model Calculates future traffic based upon :
  - Future Land Use, Densities, Street Network
  - Vehicle trips generated by each land use
  - Trips taking shortest route from origin to destination

Design Forecast (Cont.)

- Forecasted Demand in 2032 yields: 34,000 vehicles / day
- Model outputs compared to theoretical capacities
  - 3-lane section: 28,600 vehicles / day (restricted)
    - Capacity based upon acceptable operating levels is approximately 25,000 vehicles / day
  - 5-lane section: 34,000 vehicles / day
    - Capacity based upon acceptable operating levels is approximately 40,000 vehicles / day

Comparison: Future vs. Today

- Design Hourly Volumes (DHV):
  - –2210 a.m.
    - •Directional Distribution
      40% NB 60 % SB
  - –2890 p.m.
    - •Directional Distribution
      60% NB 40 % SB
- Present Peak Hour Volumes:
  - –1240 a.m.
    - •Directional Distribution
      40% NB 60 % SB
  - –1650 p.m.
    - •Directional Distribution
      60% NB 40 % SB

- Growth in AADT to 2032: approximately 81%

Local vs. Non-Local

- Computer Model shows all generated vehicle trips between all origins and destinations in MORPC area
- Paths of all trips using any selected link of network are determined
- Select Link: Hamilton (Clark State – E. Johnstown)
- O/D within vs. outside of “Gahanna Area”

Results

- 70-75% of the trips have one or both O & D within the Gahanna Area
- 25-30% have O&D starting and ending outside the Gahanna Area
- This computer generated result is a good predictor of actual conditions existing and the design year (2032)

HAMILTON ROAD
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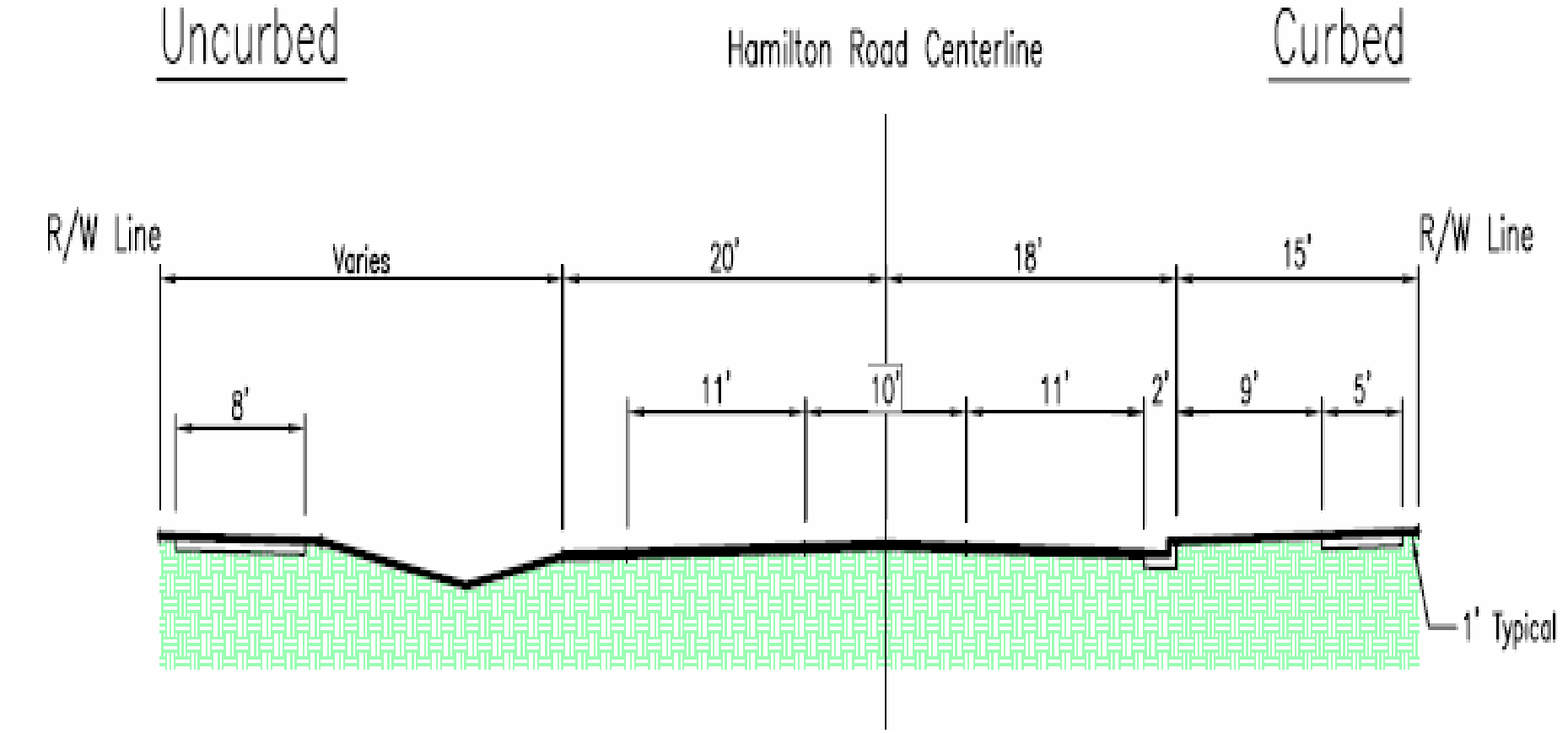
3 –Lane Alternative

- Curb & Gutter: Selected to minimize right of way acquisition impact

  (R/W = 70'min)
- 2 eleven foot (11') lanes
- ten foot (10') center turn lane
- 8'Leisure Trail (West)
- 5'sidewalk (East)

3-Lane Typical Section



3-Lane Analysis

- Principles / Analysis Tools
  - Highway Capacity Manual
    - Chapter 10 Urban Streets
    - Chapter 16 Signalized Intersections
    - Chapter 17 Unsignalized Intersections
  - Synchro
    - Signal Optimization Software
  - ODOT L&D
    - Merge Analysis

Traffic Projections

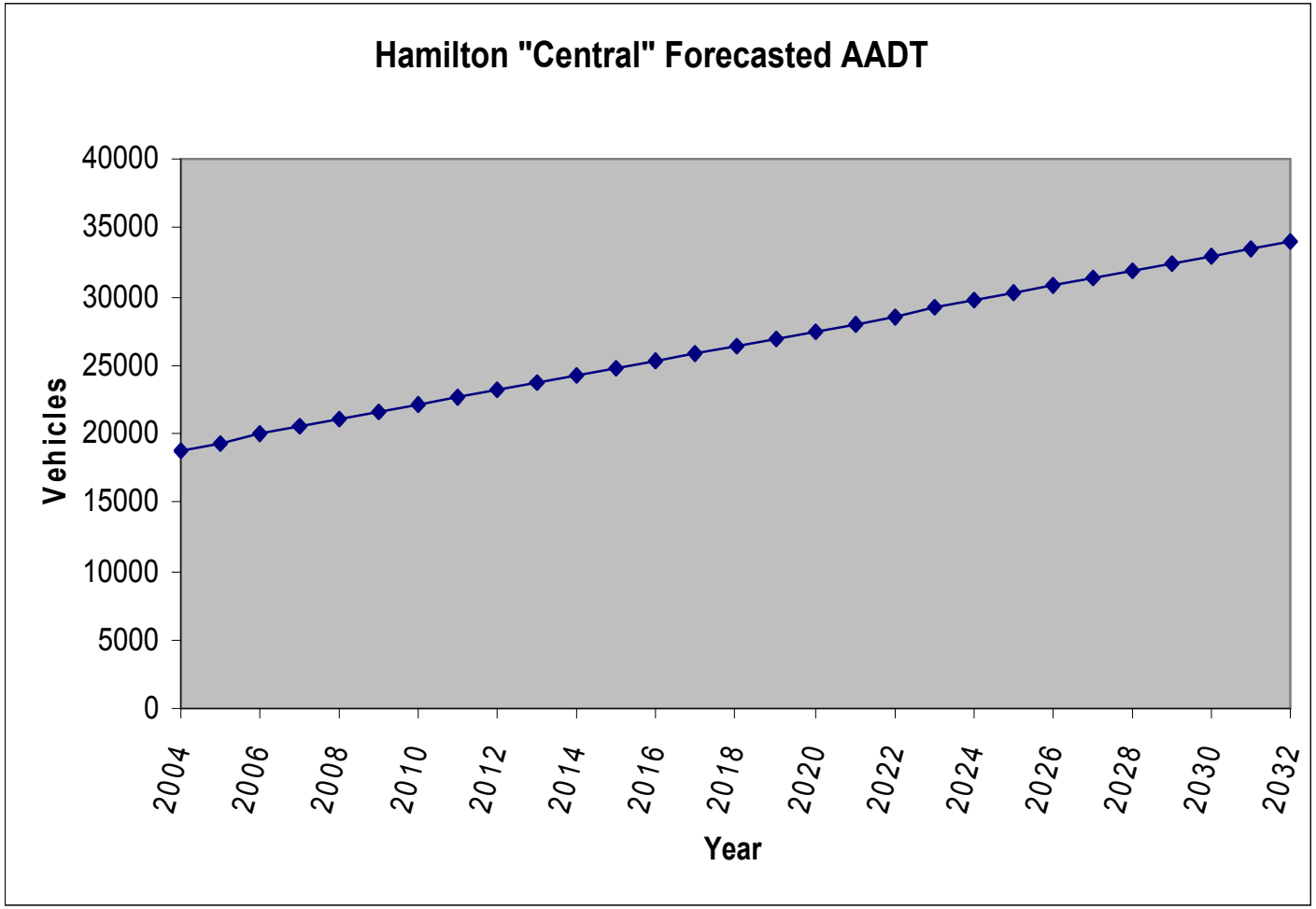


EXHIBIT 10-3. URBAN STREET CLASS BASED ON FUNCTIONAL AND DESIGN CATEGORIES

Design Category	Functional Category	
	Principal Arterial	Minor Arterial
High-Speed	I	N/A
Suburban	II	II
Intermediate	II	III or IV
Urban	III or IV	IV

EXHIBIT 10-4. FUNCTIONAL AND DESIGN CATEGORIES

Criterion	Functional Category	
	Principal Arterial	Minor Arterial
Mobility function	Very important	Important
Access function	Very minor	Substantial
Points connected	Freeways, important activity centers, major traffic generators	Principal arterials
Predominant trips served	Relatively long trips between major points and through-trips entering, leaving, and passing through the city	Trips of moderate length within relatively small geographical areas

Criterion	Design Category			
	High-Speed	Suburban	Intermediate	Urban
Driveway/access density	Very low density	Low density	Moderate density	High density
Arterial type	Multilane divided; undivided or two-lane with shoulders	Multilane divided; undivided or two-lane with shoulders	Multilane divided or undivided; one-way, two-lane	Undivided one-way, two-way, two or more lanes
Parking	No	No	Some	Significant
Separate left-turn lanes	Yes	Yes	Usually	Some
Signals/mi	0.5–2	1–5	4–10	6–12
Speed limit	45–55 mi/h	40–45 mi/h	30–40 mi/h	25–35 mi/h
Pedestrian activity	Very little	Little	Some	Usually
Roadside development	Low density	Low to medium density	Medium to moderate density	High density

LOS A describes primarily free-flow operations at average travel speeds, usually about 90 percent of the FFS for the given street class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal.

LOS B describes reasonably unimpeded operations at average travel speeds, usually about 70 percent of the FFS for the street class. The ability to maneuver within the traffic stream is only slightly restricted, and control delays at signalized intersections are not significant.

LOS C describes stable operations; however, ability to maneuver and change lanes in midblock locations may be more restricted than at LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50 percent of the FFS for the street class.

LOS D borders on a range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors. Average travel speeds are about 40 percent of FFS.

LOS E is characterized by significant delays and average travel speeds of 33 percent or less of the FFS. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.

LOS F is characterized by urban street flow at extremely low speeds, typically one-third to one-fourth of the FFS. Intersection congestion is likely at critical signalized locations, with high delays, high volumes, and extensive queuing.

LOS (FFS)	35 MPH	30 MPH
A	> 35	$\geq$ 30
B	28 -35	24 -30
C	22 -28	18 -24
D	17 -22	14 -18
E	13 -17	10 -14
F	$\leq$ 13	$\leq$ 10

EXHIBIT 10-7. EXAMPLE SERVICE VOLUMES FOR URBAN STREETS
(SEE FOOTNOTES FOR ASSUMED VALUES)

Lanes	Service Volumes (veh/h)				
	A	B	C	D	E
Class I					
1	N/A	860	930	1020	1140
2	N/A	1720	1860	2030	2280
3	N/A	2580	2780	3050	3430
4	N/A	3450	3710	4060	4570
Class II					
1	N/A	N/A	670	850	890
2	N/A	N/A	1470	1700	1780
3	N/A	N/A	2280	2550	2670
4	N/A	N/A	3090	3400	3560
Class III					
1	N/A	N/A	480	780	850
2	N/A	N/A	1030	1600	1690
3	N/A	N/A	1560	2410	2540
4	N/A	N/A	2140	3220	3390
Class IV					
1	N/A	N/A	540	780	800
2	N/A	N/A	1200	1570	1620
3	N/A	N/A	1900	2370	2430
4	N/A	N/A	2610	3160	3250

2004 (Actual) AADT: 18829

NB	count	LOS 1-lane	LOS 2-lane	**SB**	count	LOS 1-lane	LOS 2-lane
12:00 a.m.	50	N/A	N/A	12:00 a.m.	42	N/A	N/A
1:00 a.m.	24	N/A	N/A	1:00 a.m.	20	N/A	N/A
2:00 a.m.	26	N/A	N/A	2:00 a.m.	28	N/A	N/A
3:00 a.m.	24	N/A	N/A	3:00 a.m.	33	N/A	N/A
4:00 a.m.	34	N/A	N/A	4:00 a.m.	37	N/A	N/A
5:00 a.m.	61	N/A	N/A	5:00 a.m.	142	N/A	N/A
6:00 a.m.	174	N/A	N/A	6:00 a.m.	334	N/A	N/A
7:00 a.m.	461	N/A	N/A	7:00 a.m.	591	**C**	N/A
8:00 a.m.	618	**C**	N/A	8:00 a.m.	592	**C**	N/A
9:00 a.m.	542	N/A	N/A	9:00 a.m.	460	N/A	N/A
10:00 a.m.	512	N/A	N/A	10:00 a.m.	438	N/A	N/A
11:00 a.m.	654	**C**	N/A	11:00 a.m.	574	**C**	N/A
12:00 p.m.	620	**C**	N/A	12:00 p.m.	569	**C**	N/A
1:00 p.m.	598	**C**	N/A	1:00 p.m.	556	**C**	N/A
2:00 p.m.	678	**D**	N/A	2:00 p.m.	564	**C**	N/A
3:00 p.m.	730	**D**	N/A	3:00 p.m.	626	**C**	N/A
4:00 p.m.	804	**D**	N/A	4:00 p.m.	608	**C**	N/A
5:00 p.m.	954	**F**	N/A	5:00 p.m.	647	**C**	N/A
6:00 p.m.	792	**D**	N/A	6:00 p.m.	570	**C**	N/A
7:00 p.m.	618	**C**	N/A	7:00 p.m.	513	N/A	N/A
8:00 p.m.	440	N/A	N/A	8:00 p.m.	412	N/A	N/A
9:00 p.m.	296	N/A	N/A	9:00 p.m.	292	N/A	N/A
10:00 p.m.	138	N/A	N/A	10:00 p.m.	140	N/A	N/A
11:00 p.m.	90	N/A	N/A	11:00 p.m.	103	N/A	N/A
NB total	**9938**			**SB total**	**8891**		

2032 (forecasted) AADT: 34000

NB	count	LOS 1-lane	LOS 2-lane	**SB**	count	LOS 1-lane	LOS 2-lane
12:00 a.m.	90	N/A	N/A	12:00 a.m.	76	N/A	N/A
1:00 a.m.	43	N/A	N/A	1:00 a.m.	36	N/A	N/A
2:00 a.m.	47	N/A	N/A	2:00 a.m.	51	N/A	N/A
3:00 a.m.	43	N/A	N/A	3:00 a.m.	60	N/A	N/A
4:00 a.m.	61	N/A	N/A	4:00 a.m.	67	N/A	N/A
5:00 a.m.	110	N/A	N/A	5:00 a.m.	256	N/A	N/A
6:00 a.m.	314	N/A	N/A	6:00 a.m.	603	**C**	N/A
7:00 a.m.	832	**D**	N/A	7:00 a.m.	1067	**F**	N/A
8:00 a.m.	1116	**F**	**C**	8:00 a.m.	1069	**F**	N/A
9:00 a.m.	979	**F**	N/A	9:00 a.m.	831	**D**	N/A
10:00 a.m.	925	**F**	N/A	10:00 a.m.	791	**D**	N/A
11:00 a.m.	1181	**F**	**C**	11:00 a.m.	1036	**F**	N/A
12:00 p.m.	1120	**F**	**C**	12:00 p.m.	1027	**F**	N/A
1:00 p.m.	1080	**F**	N/A	1:00 p.m.	1004	**F**	N/A
2:00 p.m.	1224	**F**	**C**	2:00 p.m.	1018	**F**	N/A
3:00 p.m.	1318	**F**	**C**	3:00 p.m.	1130	**F**	**C**
4:00 p.m.	1452	**F**	**C**	4:00 p.m.	1098	**F**	N/A
5:00 p.m.	1723	**F**	**E**	5:00 p.m.	1168	**F**	**C**
6:00 p.m.	1430	**F**	**C**	6:00 p.m.	1029	**F**	N/A
7:00 p.m.	1116	**F**	**C**	7:00 p.m.	926	**F**	N/A
8:00 p.m.	795	**D**	N/A	8:00 p.m.	744	**D**	N/A
9:00 p.m.	534	N/A	N/A	9:00 p.m.	527	N/A	N/A
10:00 p.m.	249	N/A	N/A	10:00 p.m.	253	N/A	N/A
11:00 p.m.	163	N/A	N/A	11:00 p.m.	186	N/A	N/A
NB total	**17945**			**SB total**	**16055**		

Signal Analysis

- Clark State / Hamilton
- E. Johnstown / Hamilton

- Objective:

  Place forecasted Design Hourly Volumes (DHV) on alternative intersection footprints and optimize signal timings.

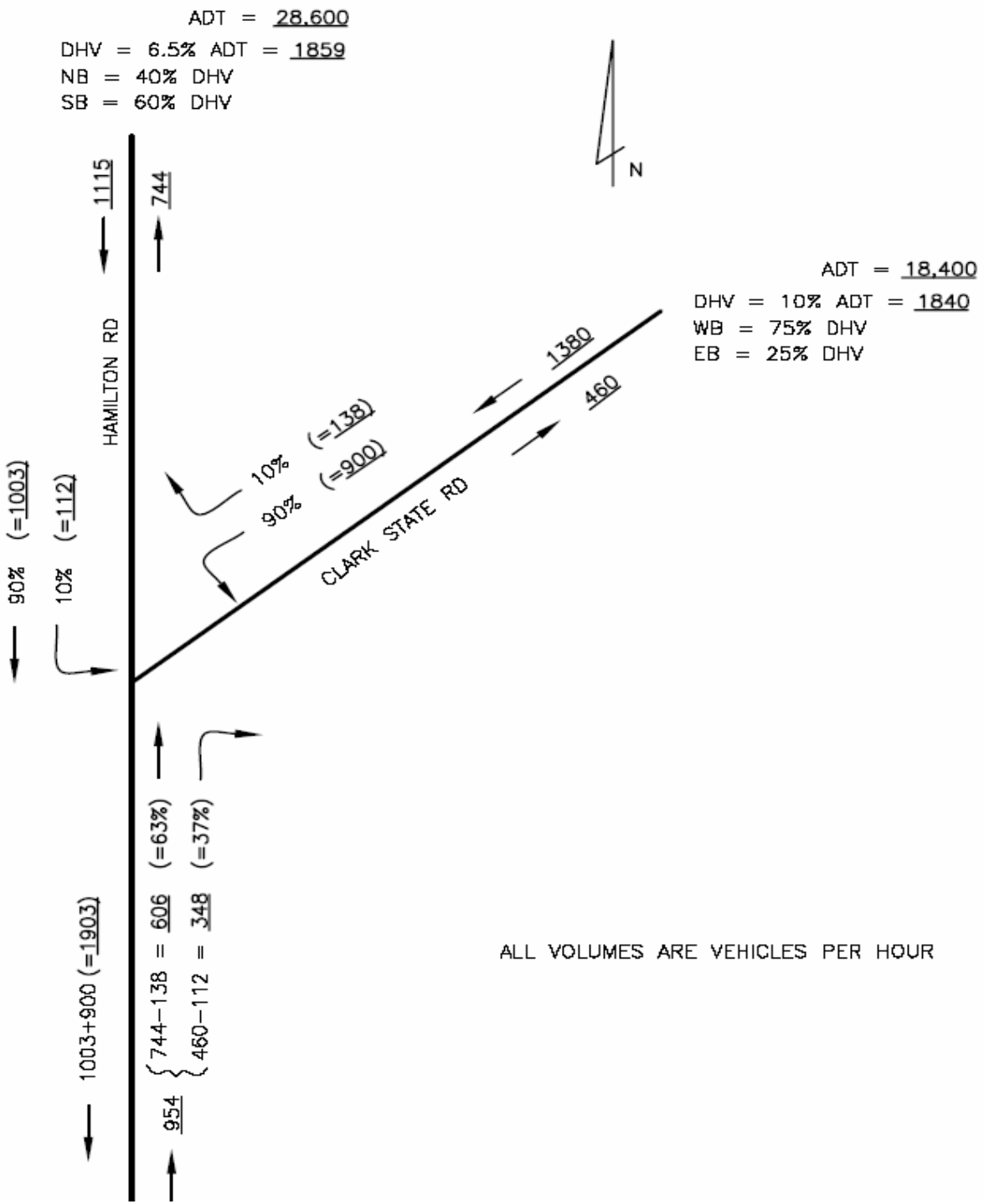
  Alternatives that produce an operating Level of Service (LOS) of C-D are common threshold operating levels.

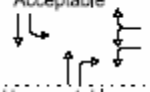
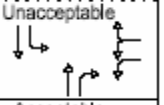
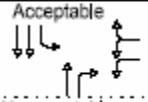
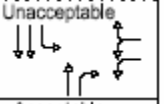
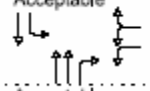
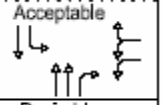
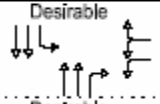
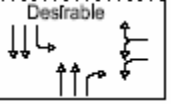
Design Hourly Volumes (DHV)

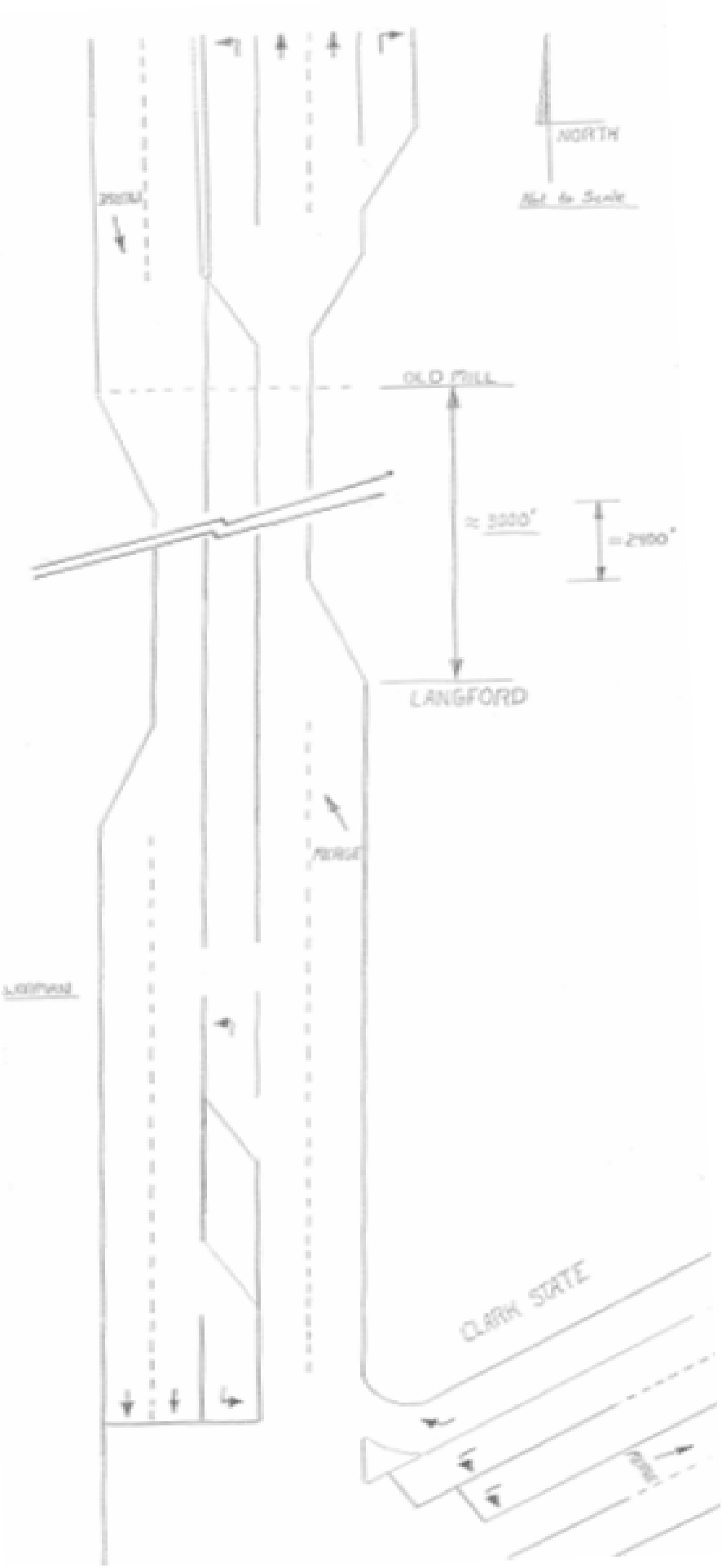
- P.M. Peak hour experiences highest volumes; therefore, DHV is set to forecasted P.M. peak volumes expected

Level of Service Criteria
Signalized Intersections

Level of Service	Average Stopping Delay per Vehicle (Sec)	Quantitive Description
A	≤ 10.0	Good progressions, few stops, and short cycle lengths (Acceptable Traffic Flow)
B	> 10.0 and ≤ 20.0	Good progression and/or short cycle lengths; more vehicle stops (Acceptable Traffic Flow)
C	> 20.0 and ≤ 35.0	Fair progression and/or longer cycle lengths; some cycle failures; significant portion of vehicles must stop (Acceptable Traffic Flow)
D	> 35.0 and ≤ 55.0	Congestion becomes noticeable; high volume-to capacity ratio, longer delays, noticeable cycle failures (Acceptable Traffic Flow)
E	> 55.0 and ≤ 80.0	At or beyond limit of acceptable delay; poor progression, long cycles, high volumes, long queues (Undesirable Traffic Flow)
F	> 80.0	Unacceptable to drivers. Arrival volumes greater than discharge capacity; long cycle lengths, unstable-unpredictable flows (Undesirable Traffic Flow)


ADT = 28,600
DHV = 6.5% ADT = 1859
NB = 40% DHV
SB = 60% DHV
N
1115
744
HAMILTON RD
ADT = 18,400
DHV = 10% ADT = 1840
WB = 75% DHV
EB = 25% DHV
1380
460
10% (=138)
90% (=900)
CLARK STATE RD
90% (=1003)
10% (=112)
1003+900 (=1903)
954
744−138 = 606 (=63%)
460−112 = 348 (=37%)
ALL VOLUMES ARE VEHICLES PER HOUR

Hamilton & Clark State Scenario	Peak Hour	Geometrics	LOS / Delay	Results
2032 Design Existing Geometrics	AM	NB: 1 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT/RT	F / 164.8	Unacceptable
2032 Design Existing Geometrics	PM	NB: 1 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT/RT	E / 77.4	Unacceptable
2032 Design 3 Lanes Added WB Lanes	AM	NB: 1 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT, 1 RT	F / 110.7	Unacceptable
2032 Design 3 Lanes Added WB Lanes	PM	NB: 1 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT, 1 RT	F / 88.0	Unacceptable
2032 Design 3 Lanes Added NBTH and SBLT	AM	NB: 2 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT/RT	F / 140.1	Unacceptable
2032 Design 3 Lanes Added NBTH and SBLT	PM	NB: 2 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT/RT	D / 44.3	Acceptable
2032 Design 3 Lanes Added Double WBLT	AM	NB: 1 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT, 1 LT/RT	D / 47.8	Acceptable 
2032 Design 3 Lanes Added Double WBLT	PM	NB: 1 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT, 1 LT/RT	E / 62.0	Unacceptable 
2032 Design 3 Lanes Added SBTH and Double WBLT	AM	NB: 1 TH, 1 RT SB: 1 LT, 2 TH WB: 1 LT, 1 LT/RT	C / 29.1	Acceptable 
2032 Design 3 Lanes Added SBTH and Double WBLT	PM	NB: 1 TH, 1 RT SB: 1 LT, 2 TH WB: 1 LT, 1 LT/RT	E / 61.0	Unacceptable 
2032 Design 3 Lanes Added NBTH and Double WBLT	AM	NB: 2 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT, 1 LT/RT	D / 45.7	Acceptable 
2032 Design 3 Lanes Added NBTH and Double WBLT	PM	NB: 2 TH, 1 RT SB: 1 LT, 1 TH WB: 1 LT, 1 LT/RT	D / 43.9	Acceptable 
2032 Design 3 Lanes Added NB/SBTH and Double WBLT	AM	NB: 2 TH, 1 RT SB: 1 LT, 2 TH WB: 1 LT, 1 LT/RT	C / 24.6	Desirable 
2032 Design 3 Lanes Added NB/SBTH and Double WBLT	PM	NB: 2 TH, 1 RT SB: 1 LT, 2 TH WB: 1 LT, 1 LT/RT	C / 25.8	Desirable 


NORTH
OLD MILL
≈ 3000'
≈ 2900'
LANGFORD
CLARK STATE

Unsignalized Intersections

Side Street Capacity Comparisons of Design Alternatives

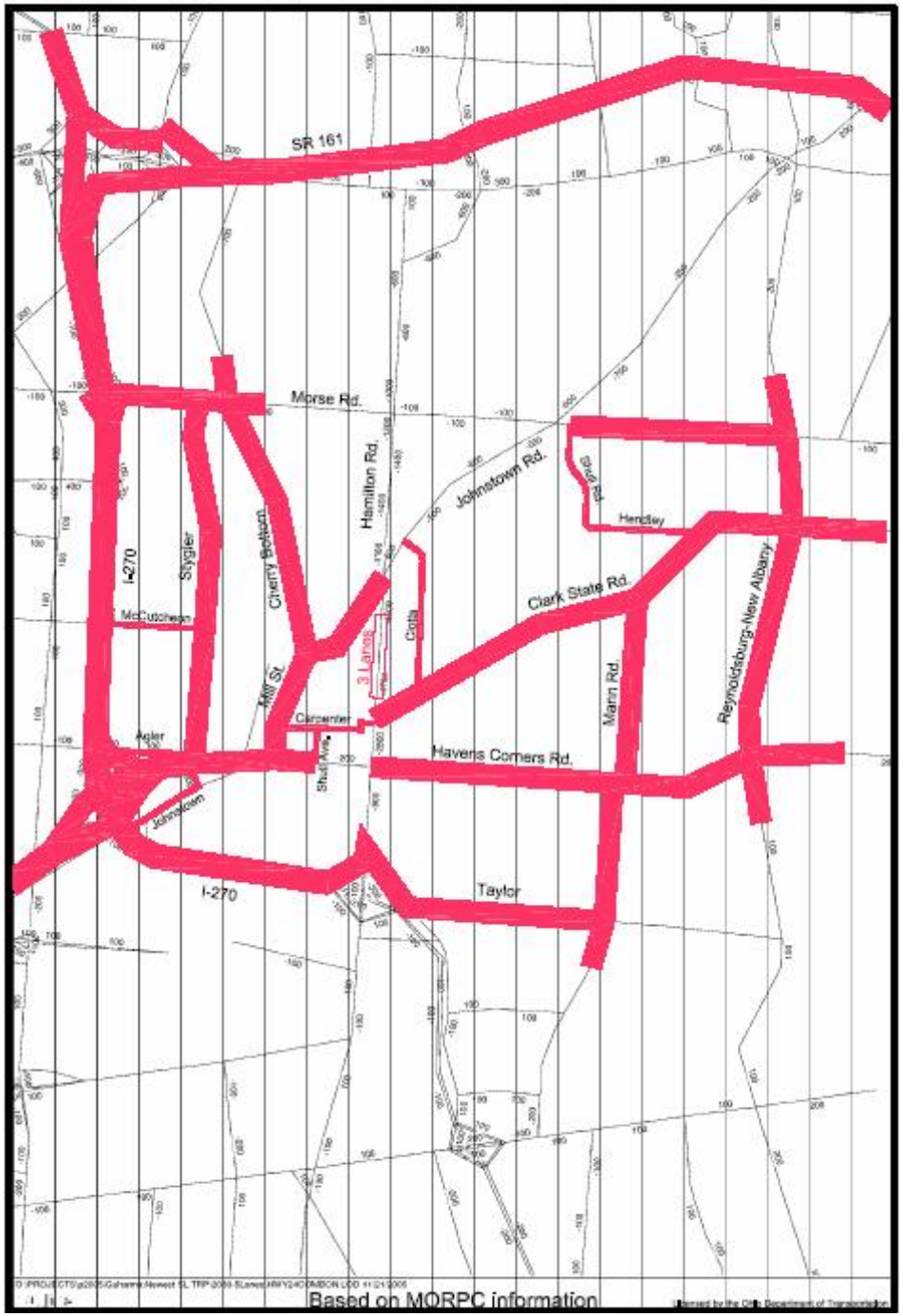
Location	Peak Hour	4 Lane Alternative			3 Lane Alternative			5 Lane Alternative		
		LOS	*Delay*	*Queue*	*LOS*	*Delay*	*Queue*	*LOS*	*Delay*	*Queue*
Office Building	AM	E	43.4	25	F	50.7	25	C	**22.0**	25
	PM	F	267.1	125	F	*	*	D	**25.9**	25
Old Mill	AM	D	27.6	25	D	28.9	25	C	**16.3**	25
	PM	F	159.8	25	F	84.5	25	D	**32.7**	25
Thoburn	AM	D	27.6	25	C	19.1	25	C	**16.3**	25
	PM	F	96.6	25	E	35.4	25	D	**32.7**	25
Sycamore Woods	AM	E	45.5	25	C	24.5	25	C	**22.5**	25
	PM	F	59.9	25	D	26.6	25	C	**21.3**	25
Medwin	AM	D	27.6	25	C	19.1	25	C	**16.3**	25
	PM	F	96.6	25	E	35.4	25	D	**32.7**	25
School Exit	AM	F	38.4	50	C	21.5	25	C	**17.8**	25
	PM	F	238.2	100	E	45.7	50	E	**41.3**	25
Future Drive/ Peale	AM	F	71.0	50	D	27.3	25	D	**26.7**	25
	PM	F	100.7	25	D	33.0	25	D	**25.1**	25
Tresham	AM	E	42.9	50	C	23.5	25	C	**19.4**	25
	PM	F	169.4	50	E	40.3	25	E	**38.5**	25
Langford	AM	D	27.6	25	C	19.1	25	C	**16.3**	25
	PM	F	96.6	25	E	35.4	25	D	**32.7**	25
Allenby	AM	D	28.3	25	C	21.4	25	B	**14.9**	25
	PM	F	718.0	50	F	141.5	25	E	**44.6**	25
Worman	AM	E	42.1	50	D	31.0	50	C	**21.0**	25
	PM	F	288.3	150	F	52.3	50	C	**18.5**	25
Carpenter	AM	F	*	*	F	342.7	125	F	*	*
	PM	F	*	*	F	*	*	F	*	*

Build it they will come…
Don't build it…they'll go elsewhere

- MORPC Model supports demand will be there
- Capacity of 3-lanes is limiting; therefore, diversion will ultimately occur on neighboring streets
- Clotts, Carpenter, Shull, Clark State, Mill Street
- When 3-lane constraint was placed upon the model, 5-6000 vehicles were displaced while operating service levels maintained at "F"

Difference In Volumes between 5 Lane and 3 Lane Scenarios

Highlighted streets represent additional volume on that segment in the 3 lane scenario.



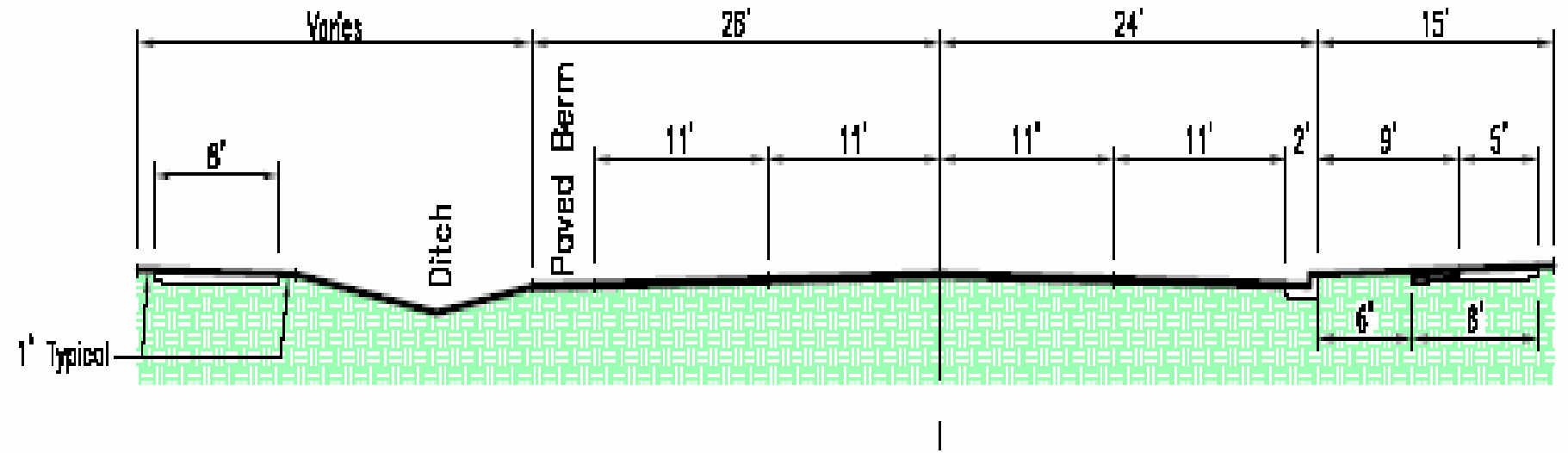
Safety / Community Impacts

- Police / Fire: Impacts on Emergency Response times
  - LOS (F) operating speeds < 13 MPH
    - 5-6 minutes or more to travel 1 mile
  - LOS (C) operating speeds 22-28 MPH
    - Range of 2-3 minutes to travel 1 mile
- Defer to Development Dept. regarding economic impacts

Alternative Street Designs Studied

- Four Lanes
- Four Lanes with few added turn lanes
- Four Lanes with median
- Five lanes
  - –4 thru lanes + two-way left turn lane

Four Lane Alternative



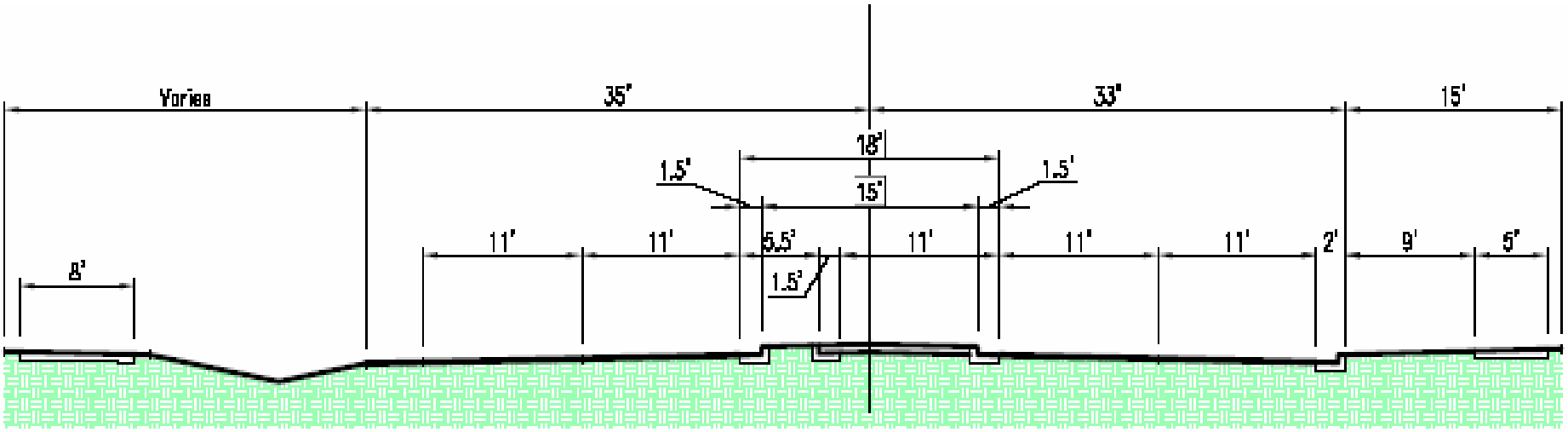
Four Lane Attributes

+ Four moving lanes throughout
+ Low initial construction cost
-All left turns must turn from thru lanes
-Safety impacts for thru traffic and emergency runs
-Vehicle delays on side streets and residential drives

Four Lanes w/ few left turn lanes

+ Four moving lanes throughout
+ “Major”side streets have separate left turn lanes
-All thru traffic must move (right or left) at these locations
-Remaining left turns may unexpectedly stop in thru lanes
-High safety impacts on all road users
-Low useful-life of project and service to community

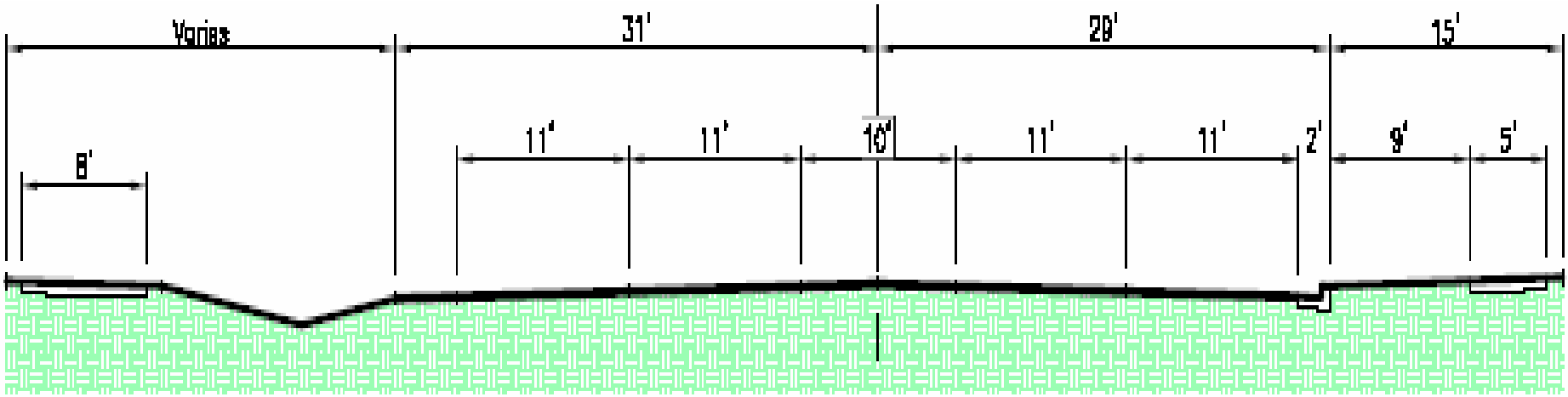
Four lanes with median



Four lanes with median

+ Four thru lanes throughout
+ compatible with project to the north
+ Separate left turn storage at all side streets and major drives
+ median landscape opportunities
-High initial construction cost
-May restrict vehicle access to some abutting properties

Five Lane Alternative



Five Lane Alternative Attributes

+ Four thru lanes
+ Left turn storage to all side streets and residential drives
+ Highest level of safety and operational efficiency
+ Low delay and safety impacts on all side streets and drives
+ Low overall Impact on Community

-High initial construction cost and R/W impacts

Ranking of Design Alternatives

Project Evaluation Factors	Design Alternatives				
	3 Lane	*4 Lane*	*4 Lane + LT's*	*5 Lane*	*4 Lane + Median*
Safety	5	3	4	1	2
Operation	5	4	3	1	2
Construction Costs and R/W	1	2	3	4	5
Service to all Users	5	3	4	1	2
Impact on Abutting Properties	1	3	4	2	5
Maintenance	3	4	5	1	2
Useful Life of Project	4	3	5	1	2
Impact on Community	5	3	4	1	2
Total Score	29	25	32	12	22
Overall Ranking	**4**	**3**	**5**	**1**	**2**

Cost Comparison

	3-Lane		5-Lane	OPWC (60%)	County (20%)	Gahanna (20%)	County (50%)	Gahanna (50%)
Roadway	$1,500,000		$2,750,000					
Culvert	$225,000		$357,000					
Storm	$565,000		$720,000					
MOT	$250,000		$400,000					
Bridge	$900,000		$900,000					
Signal	$175,000		$175,000					
Sidewalk	$220,000		$220,000					
Bikeway	$258,500		$258,500					
Comm	$320,000		$320,000					
Waterline	$640,000		$640,000					
Lighting	$350,000		$350,000					
Const. Totals	$5,403,500		$7,090,500	$4,254,300	$1,418,100	$1,418,100	$3,545,250	$3,545,250

	3-Lane		5-Lane	OPWC (60%)	County (20%)	Gahanna (20%)	County (50%)	Gahanna (50%)
Construction	$5,403,500		$7,090,500	$4,254,300	$1,418,100	$1,418,100	$3,545,250	$3,545,250
R/W	$305,000		$1,250,000	$750,000	$250,000	$250,000	$625,000	$625,000
Design	$648,500		$850,750	$510,450	$170,150	$170,150	$425,375	$425,375
Co Payback	$600,000		-					
Inspection	$432,275		$567,250	$340,350	$113,450	$113,450	$283,625	$283,625
Totals	$7,389,275		$9,758,500	$5,855,100	$1,951,700	$1,951,700	$4,879,250	$4,879,250

Questions ?